US Experience with Incentives for Energy-Efficient and "Fortified" New Buildings:-- Some Possible Lessons for Turkey

GYODer, Istanbul
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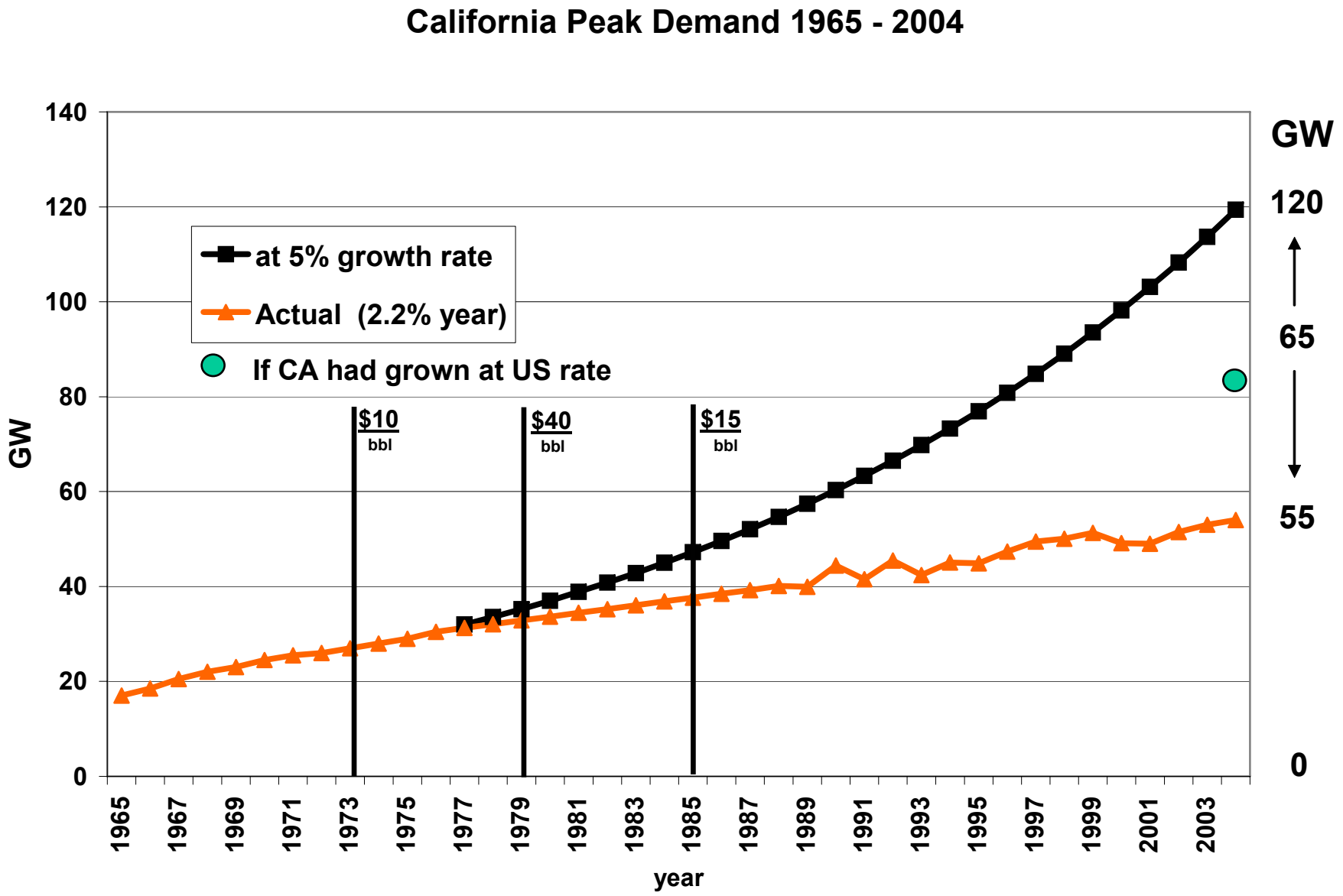
With Dr. Metin Lokmanhekim



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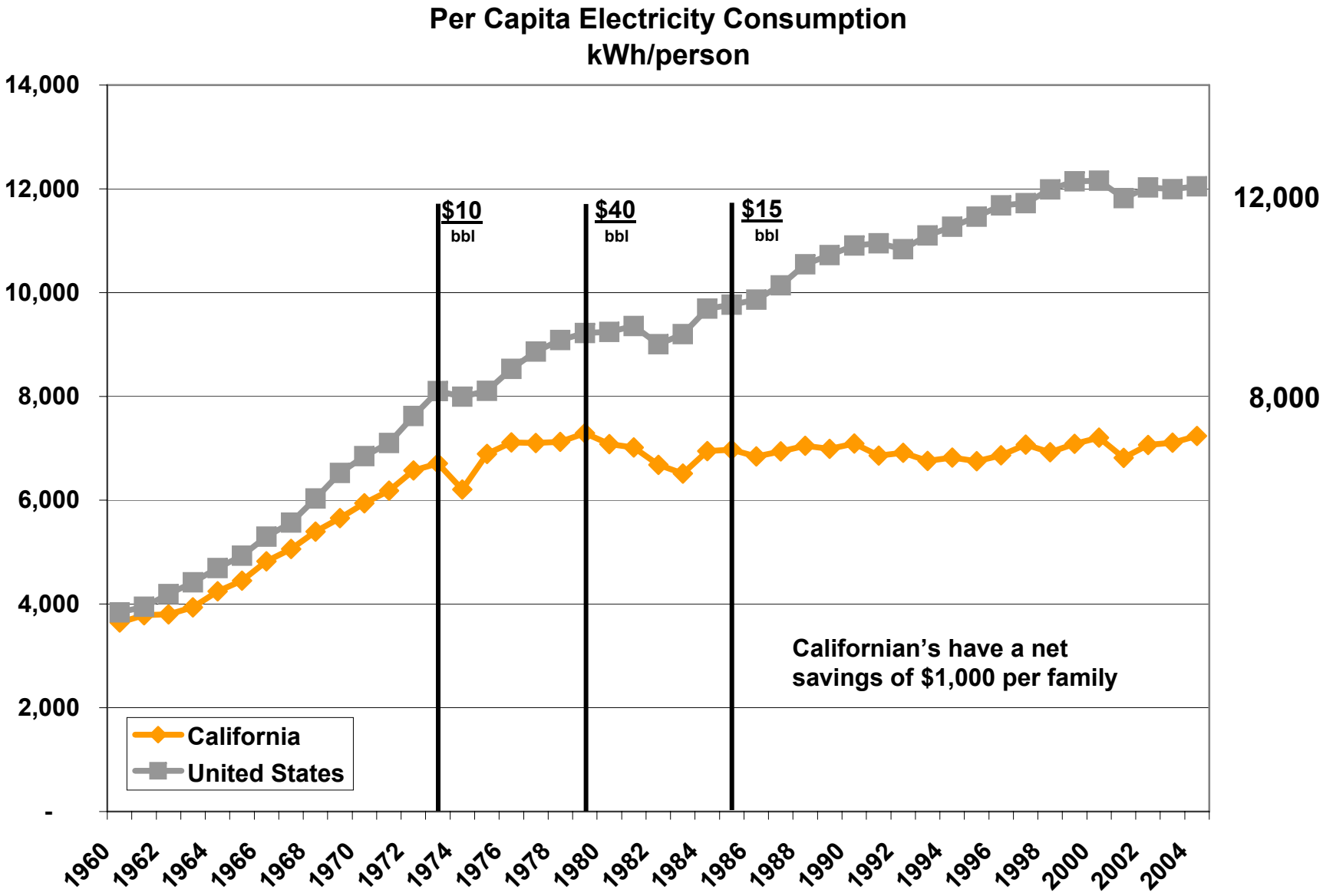
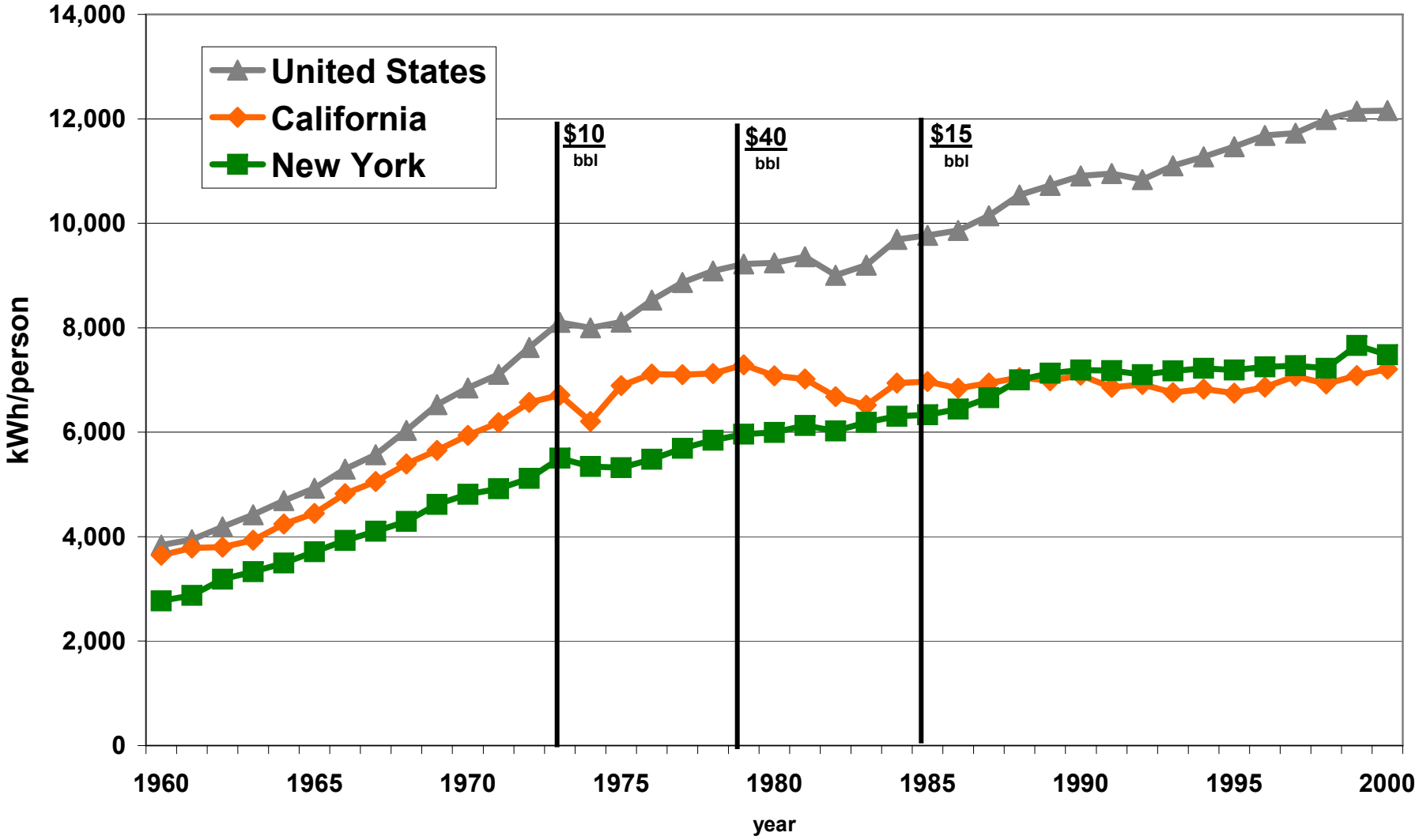


Source: http://www.eia.doe.gov/emeu/states/sep_use/total/csv/use_csv

Per Capita Electricity Consumption

Source: http://www.eia.doe.gov/emeu/states/sep_use/total/csv/use_csv



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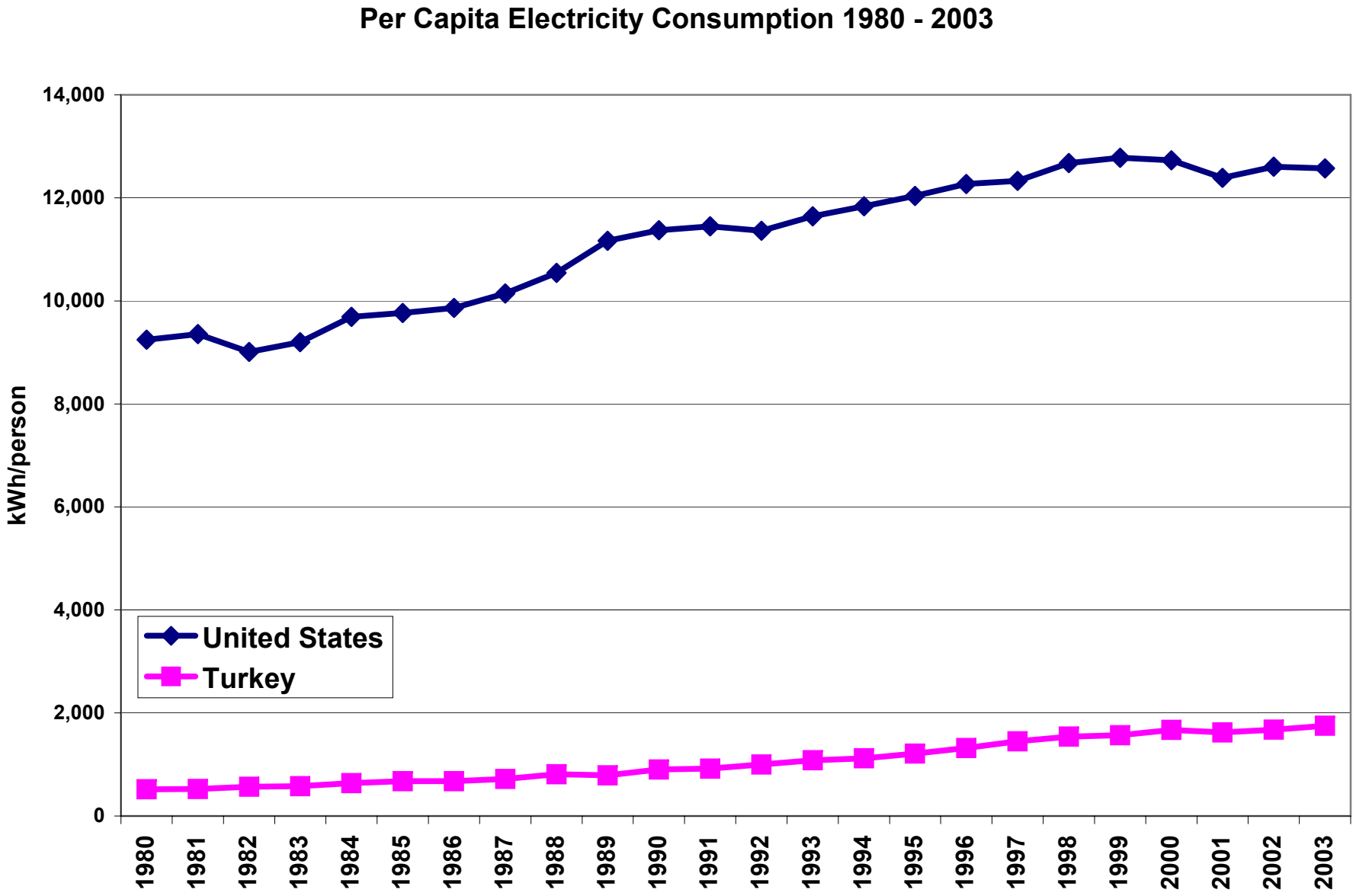
Costs and Pollution Saved by Avoiding a 50% expansion of California Electric System.

- In California, passenger cars emit about the same amount of pollution as electricity, so avoiding 50% more electricity is equivalent to avoiding 50% more cars, in fact equivalent to avoiding 10 million cars.



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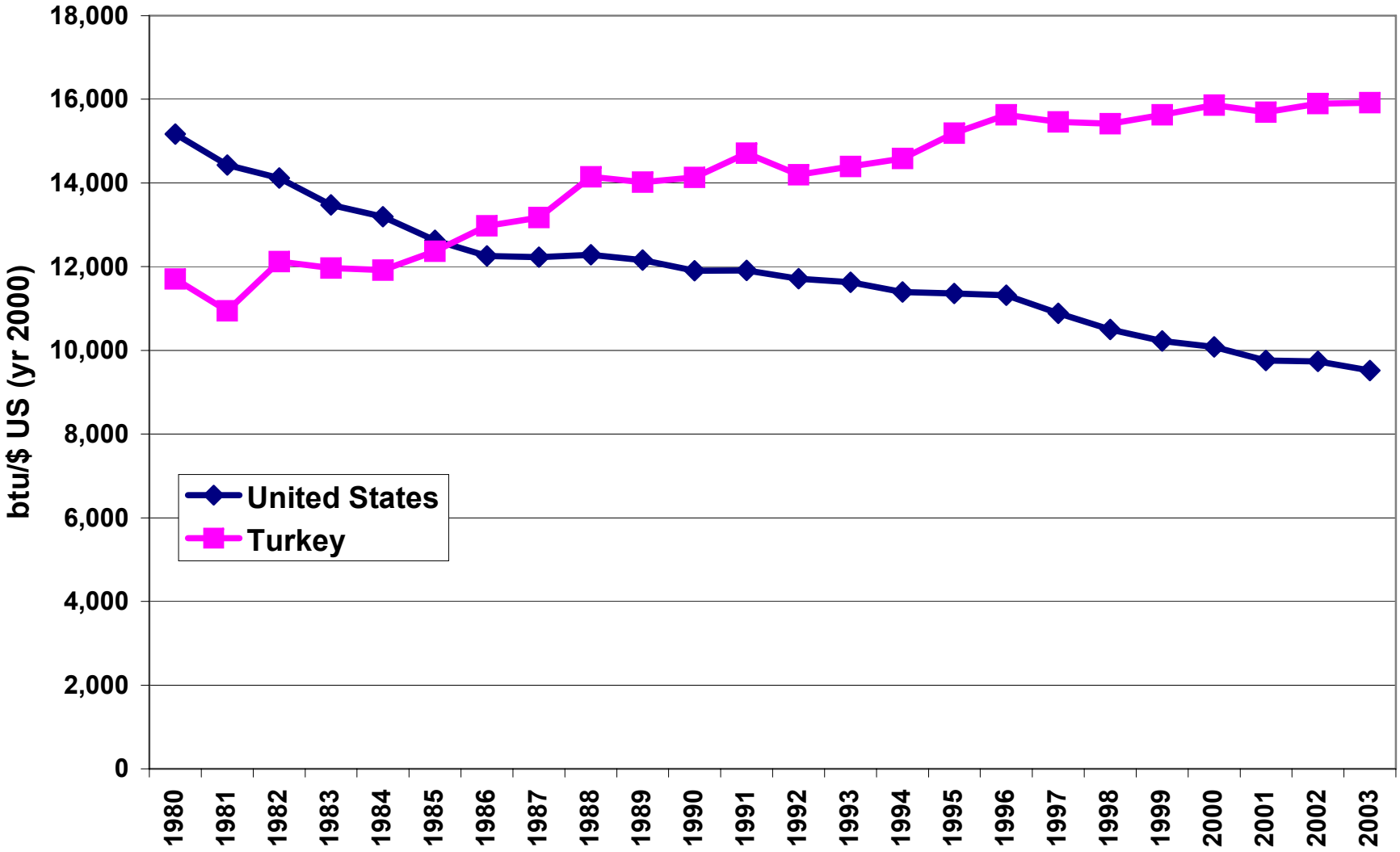
Energy Intensity (Btu per $ at Market Exchange Rate)



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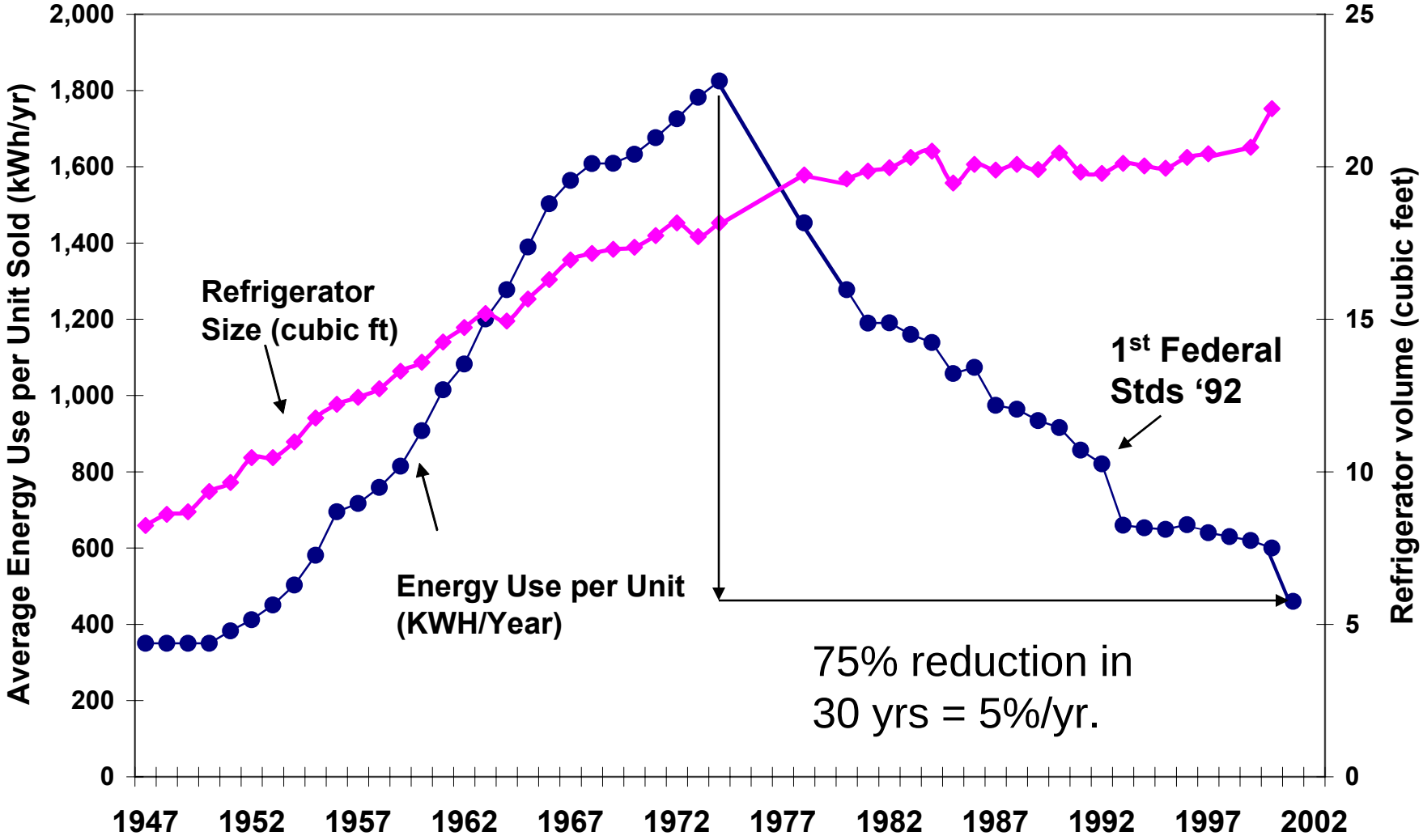
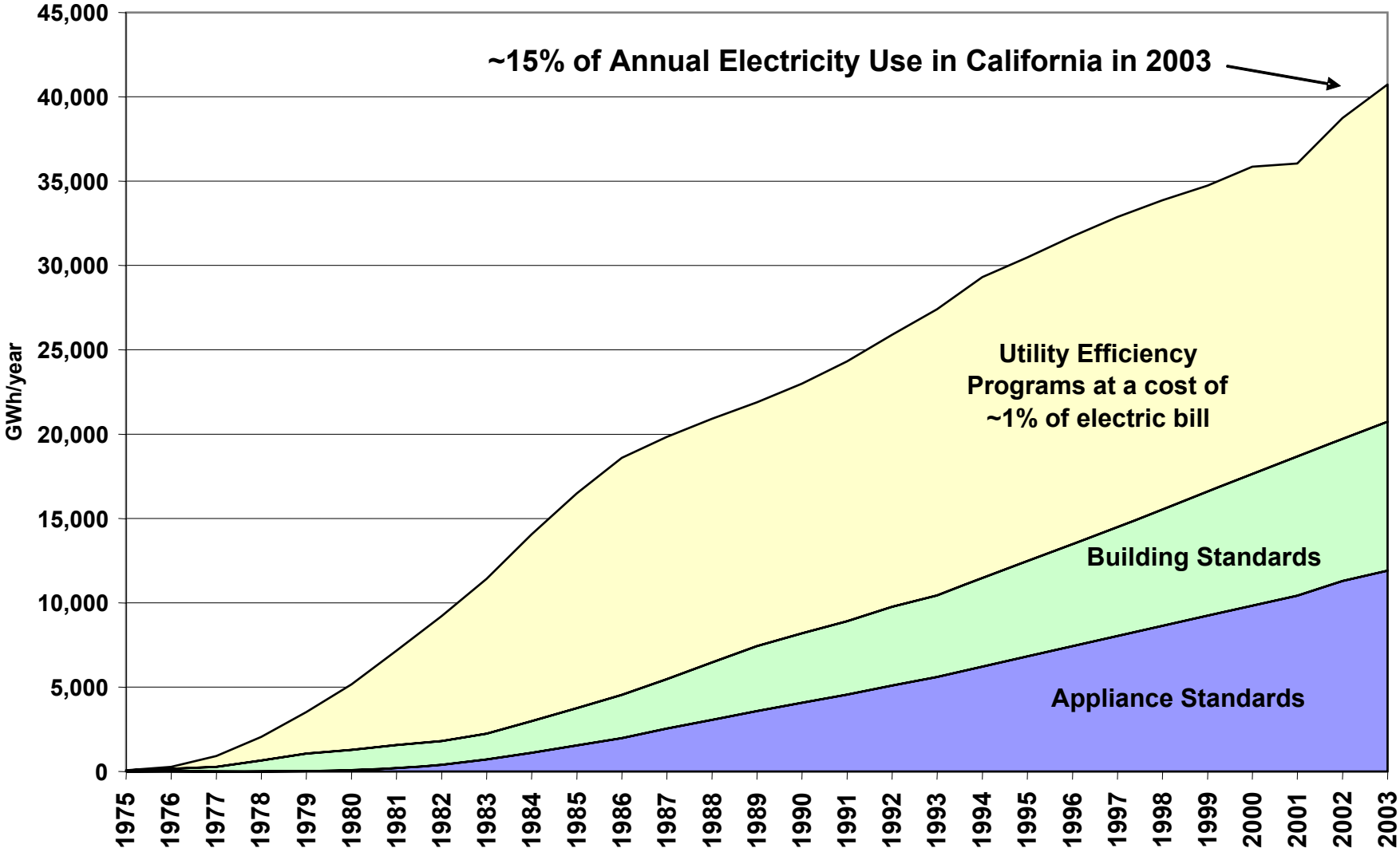
United States Refrigerator Use v. Time



Source: David Goldstein

Annual Energy Savings from Efficiency Programs and Standards



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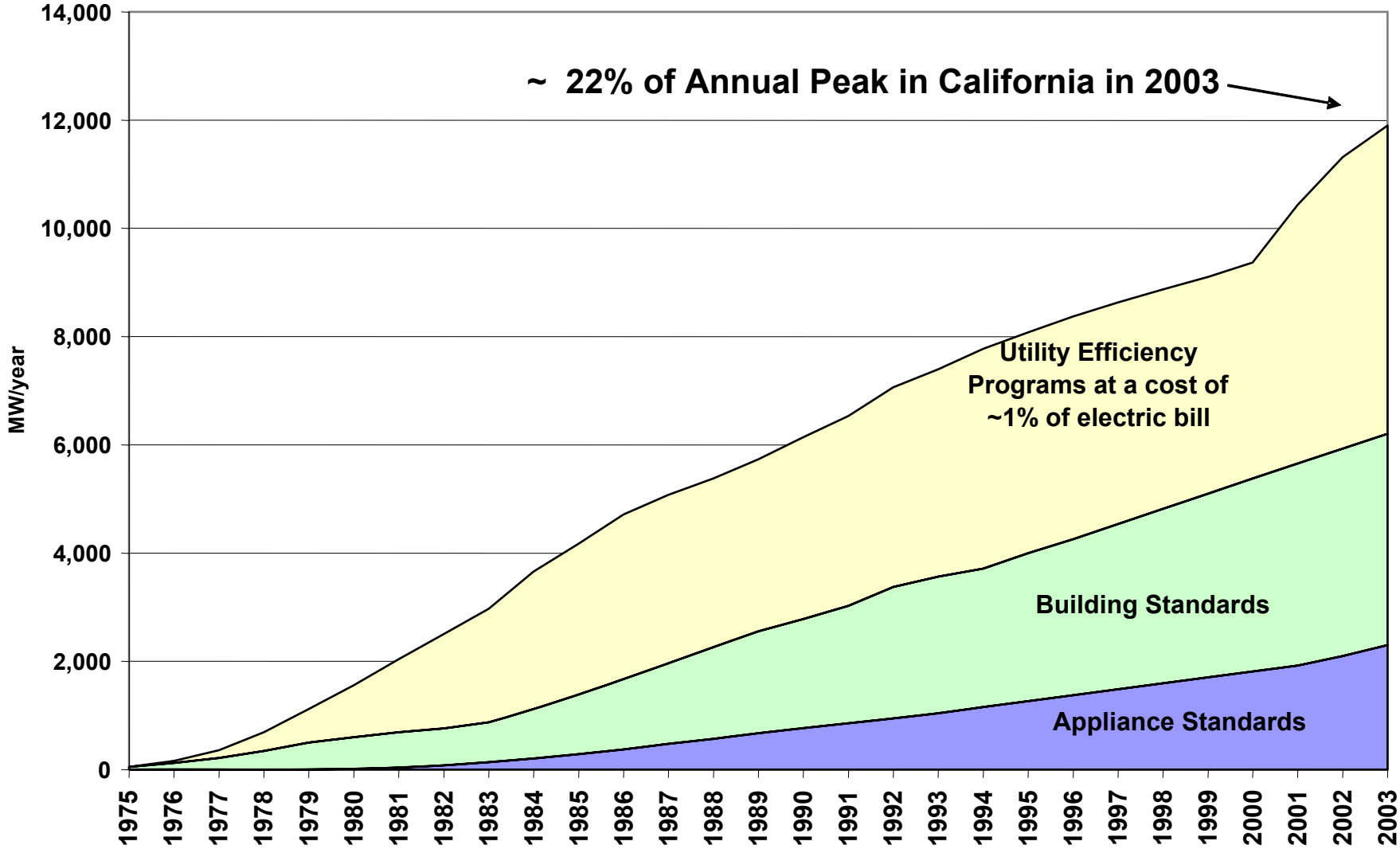
Annual Peak Savings from Efficiency Programs and Standards



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Insurance for “Fortified” Buildings

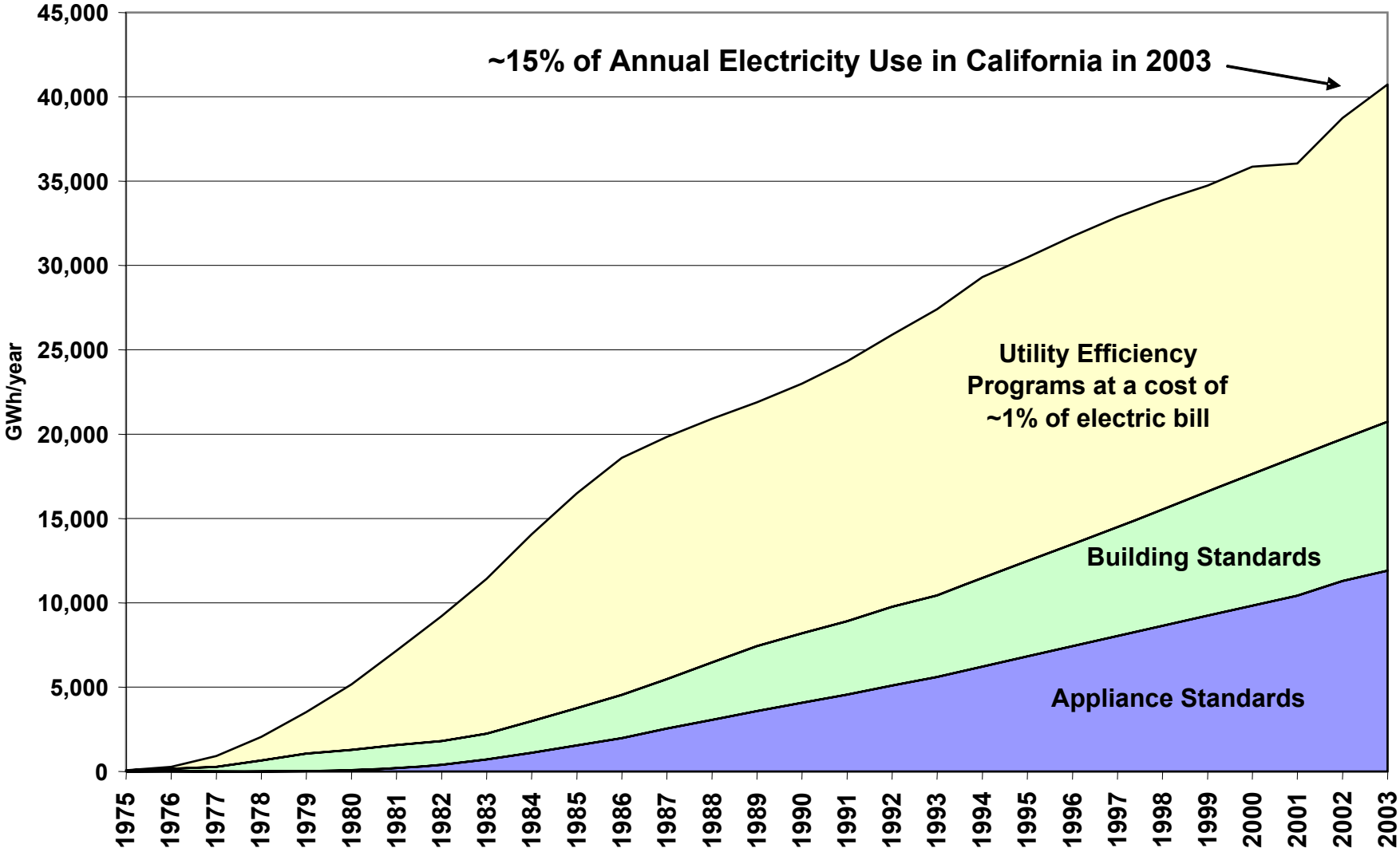
- Led by IBHS, the Institute for Building and Home Safety, supported by 220 insurance companies. **www.IBHS.org**.
- A “Fortified” building is constructed to resist damage from earthquakes, wind, flood, fire, hail, etc.,
  - The “Fortified” standard significantly beat existing code
- The “Fortified” specification of course depends on location – for example both Turkey and the US West Coast face seismic risk.
- IBHS writes the standards, and trains and certifies inspectors, but the marketing and discounts in annual insurance are left to member insurance companies.
- For example, Google **Florida Windstorms Underwriting Association**

Discounts offered by Insurance Companies for Fortified Buildings

- The highest discount I found was 60% on the **Hurricane** PORTION of an insurance policy for a home in Florida. Chuck Vance of IBHS guessed that this might represent a 25% discount on the overall policy.
- I Googled **"Fortified Housing"** and found offerings of discounts of 5-25% off the overall policy.
- For Turkey it might be cost-efffective to offer a smaller discount just for inspection by a certified code inspector.

- An entirely different incentive for Turkey might be a reduction in annual taxes on buildings.

Annual Energy Savings from Efficiency Programs and Standards



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Discounts vs. Up-front “Rebates.”

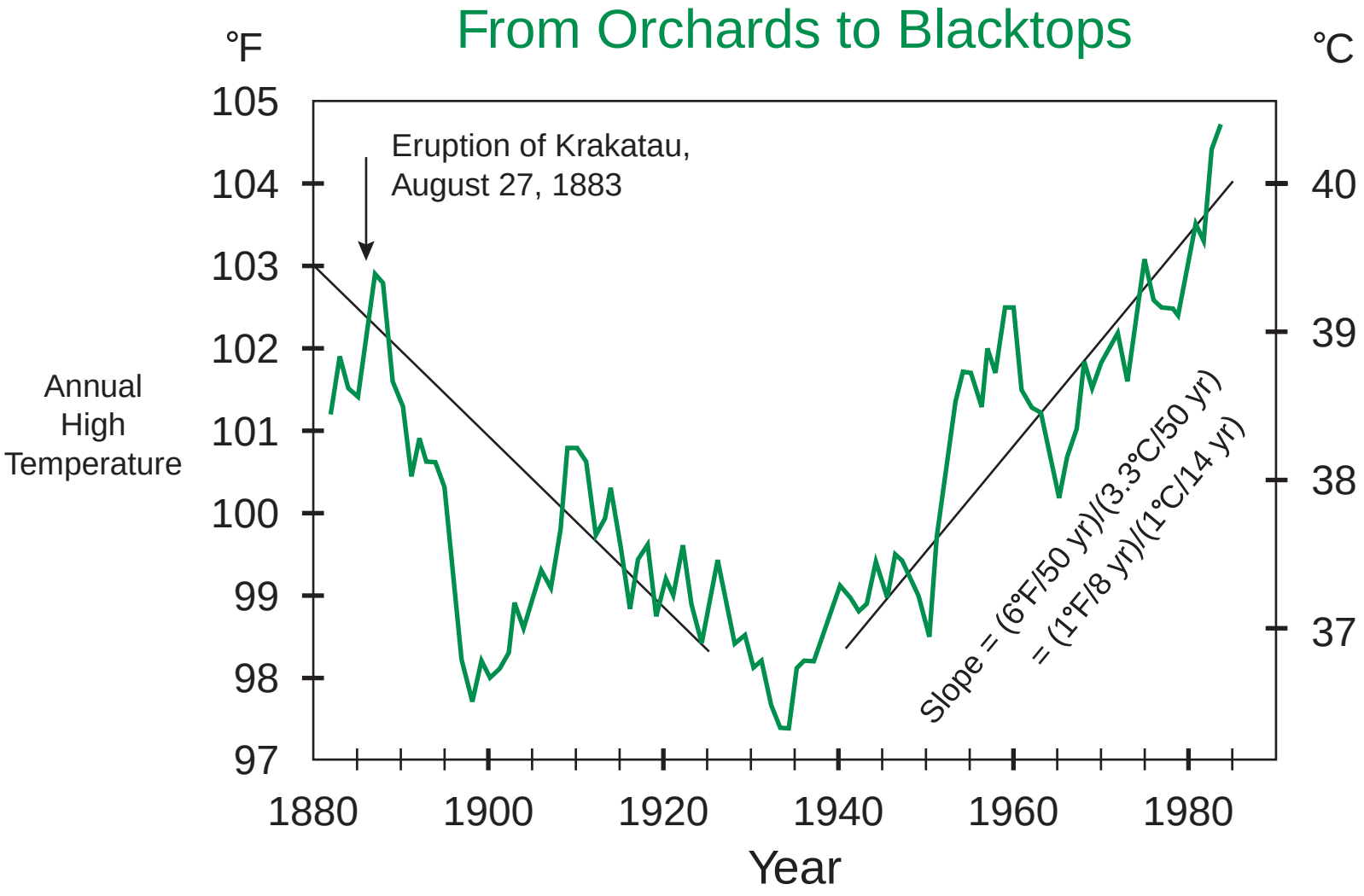
- In California we spend 1-2% of all electric revenues on incentives to beat existing building and appliance standards. This works because people respond to up-front “rebates” rather than to distant bill savings.
- Implication. Take some of the discount on insurance rates for fortified homes and offer FREE insurance for the first year

Combatting Summer Heat Islands

- White flat roofs save 10-20% of air conditioning load
- Cool colored sloping roofs save 5-10% of a/c
- Cool roofs also cool urban heat islands, for example for Los Angeles
  - The heat island is about 4 deg. C, of which roofs cause 1deg.

  Visit EETD.LBL.gov/HeatIsland

Temperature Trends in Downtown Los Angeles



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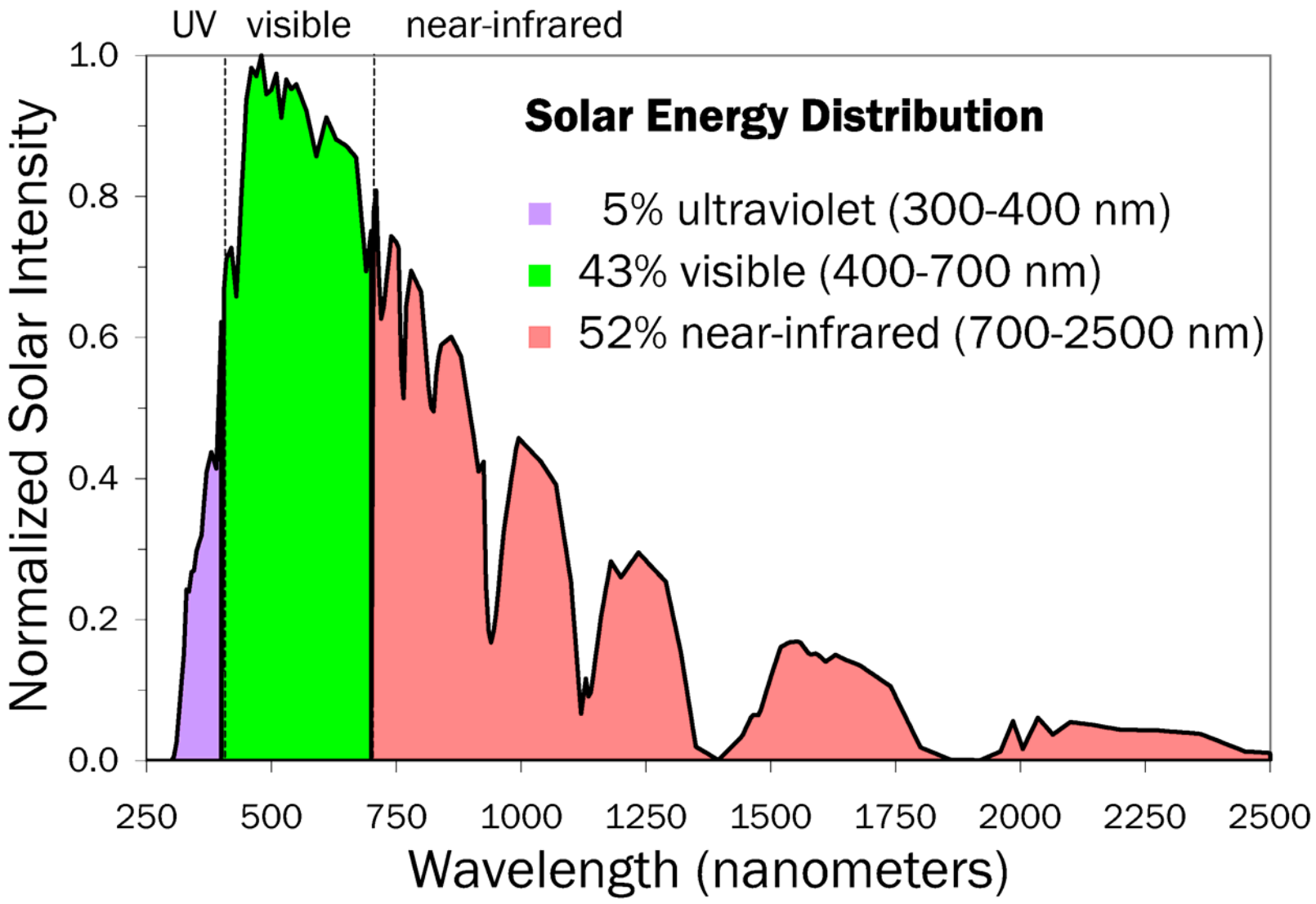
Cool Communities

- The most lucrative way to:
  - Save air conditioning
  - Cool cities
  - Reduce Urban Ozone
- Involves 3 strategies:
  - White roofs (5,000 yr old idea) and cool **colored** roofs (a new idea)
  - Cooler pavements (concrete colored to avoid glare)
  - Shade trees (shade buildings and cool by evapo-transpiration)
- CEC spent $10 Million for white “re-roofs” and offers credits for cool roofs in meeting new building standards
- Benefits can be substantial:
  - In LA Basin, 3 strategies can save 1,500 MW and $ 200 million per year in A/C; Cool LA by 3-4 degrees Celsius; and reduce ozone by 4 – 8 %, worth another $ 250 million per year in reduced sickness and sick leave

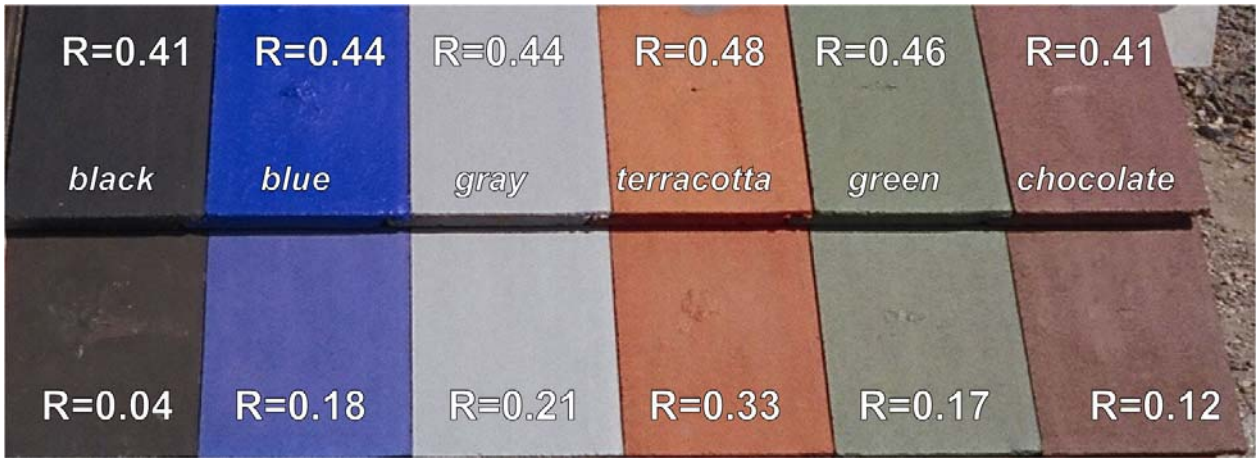
California Cool Roof Policies

- Annual Public Goods-funded Utility programs of $2 to $3 M/year, offer rebates of ~10 cents/sqft.
- 2005 Building Standards for flat roofs: White is required.
- 2008 Building Standards for sloped roofs: Cool required (any color).
- Most buses have white roofs
- White cars should be bought for public and private fleets
- R&D
  - Cool Colored Roofs, including cars (recommended in Pavley Report) to reduce emissions by 30%
  - Service Life of Cooler Roofs
- Adding Cool communities to State Implementation Plans is frustratingly slow



Source: Hashem Akbari, LBNL

Cool and Standard Color-Matched Coatings for Concrete Tiles



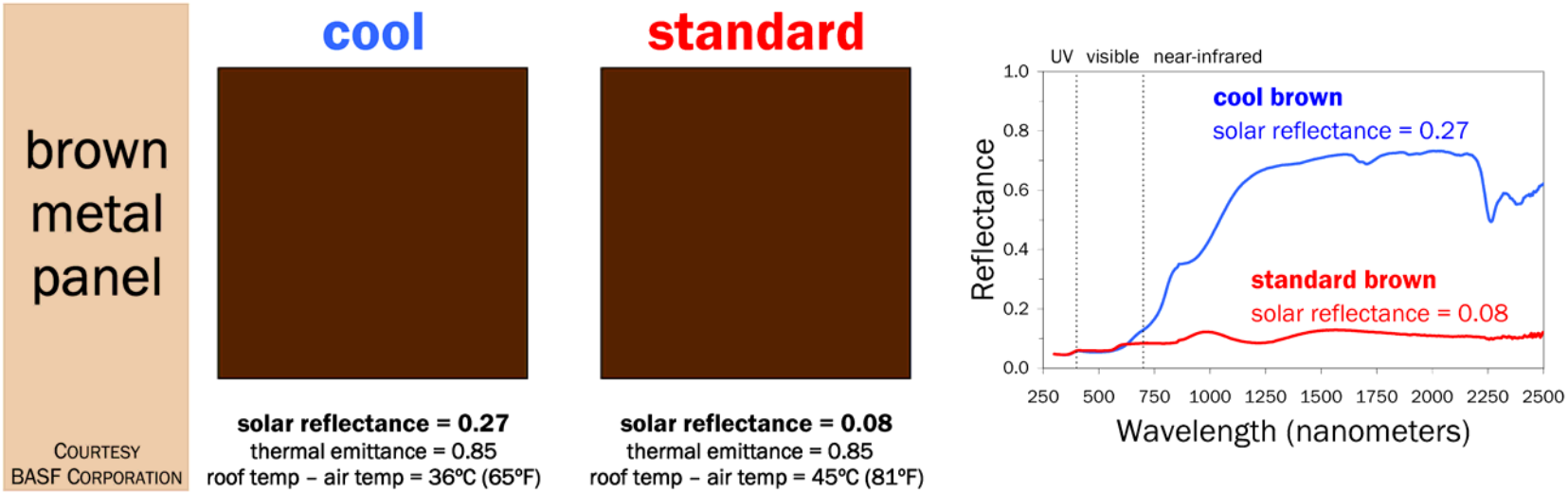
cool

standard

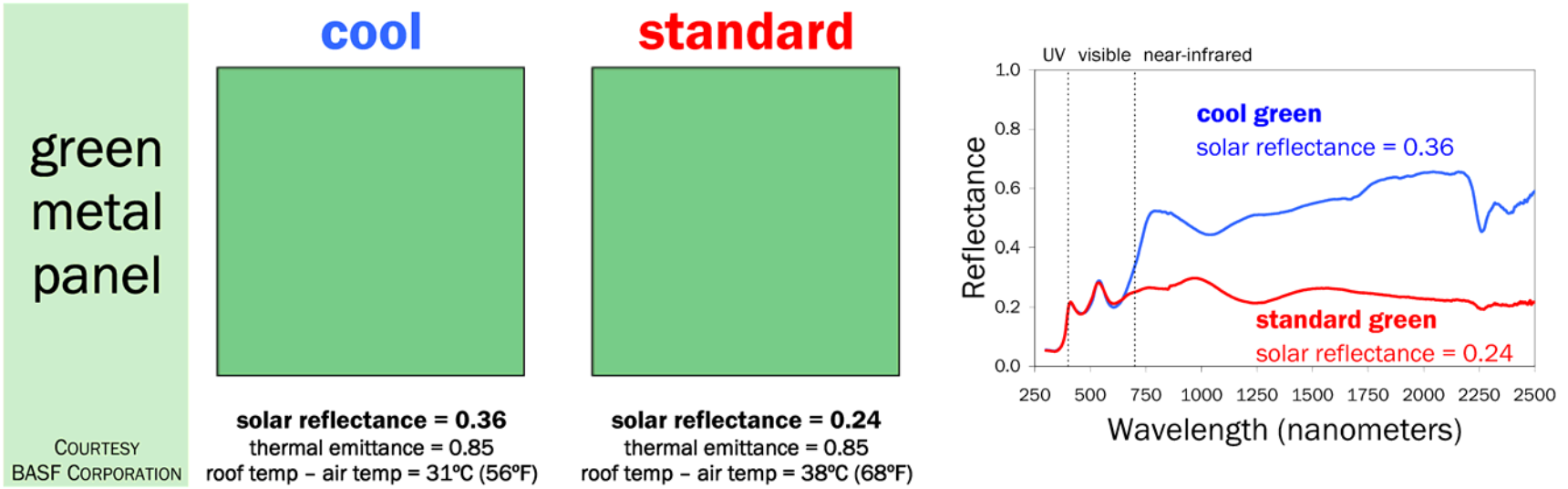
ΔR=0.37 **ΔR=0.26** **ΔR=0.23** **ΔR=0.15** **ΔR=0.29** **ΔR=0.29**

- Can increase solar reflectance by 0.3 or more
- Gain greatest for dark colors

Courtesy: American Rooftile Coatings



Source: Hashem Akbari, LBNL



Source: Hashem Akbari, LBNL

The following backup slides on Calif. Energy Policy will are not part of my talk, but might be useful during discussions.

Funding and Energy Savings From Investor-Owned Utility Energy Efficiency Programs In California for Program Years 2000 Through 2004

Formerly Entitled:
Funding and Savings for Energy Efficiency Programs
For Program Years 2000 Through 2004

Cynthia Rogers
Mike Messenger
Sylvia Bender

August 2005
CEC-400-2005-042-REV

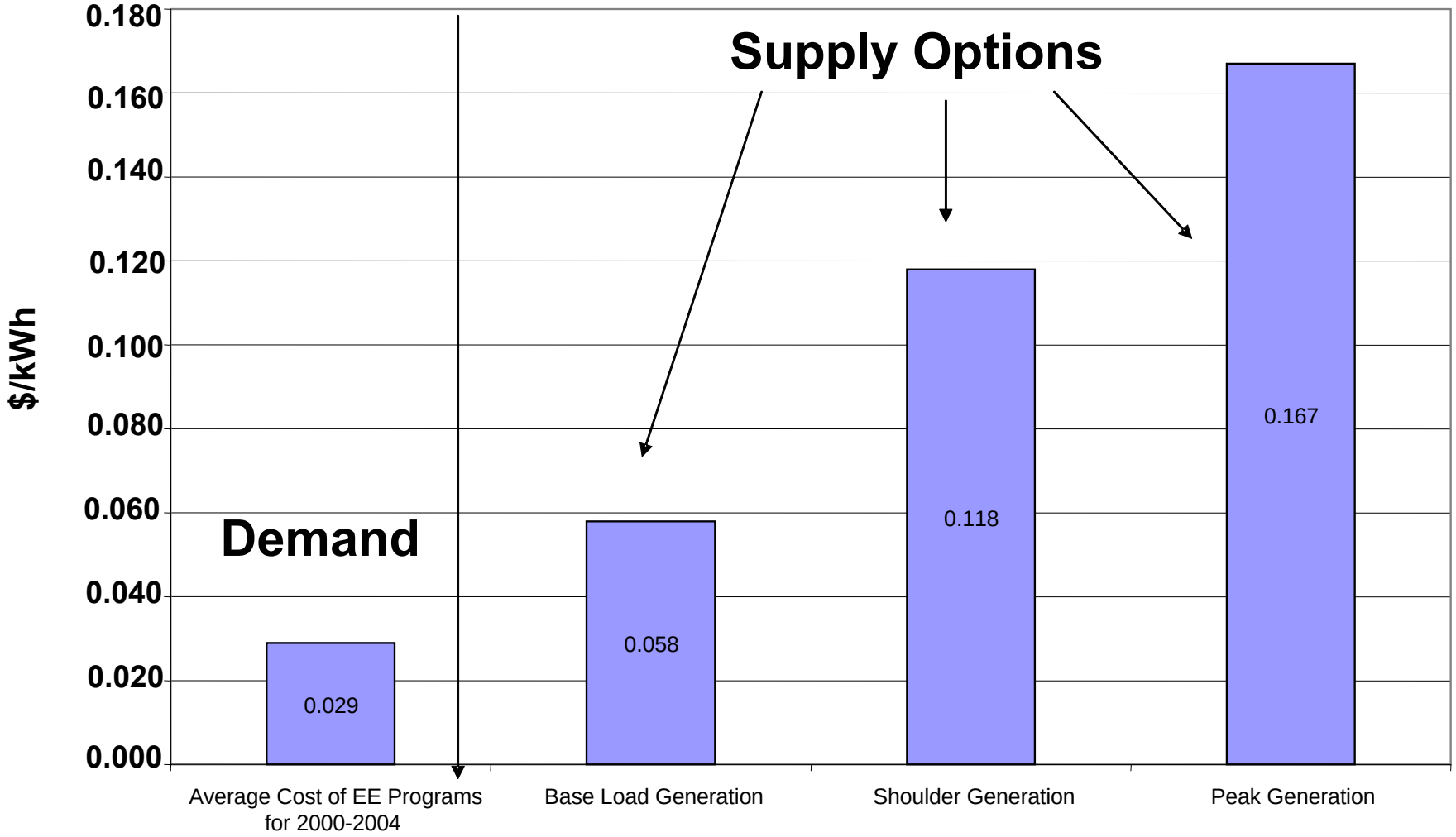
http://www.energy.ca.gov/2005publications/CEC-400-2005-042/CEC-400-2005-042-REV.PDF

Table 1
2004 FIRST YEAR Savings (GWh) for PG&E, SCE and SDG&E, and 2004 Funding

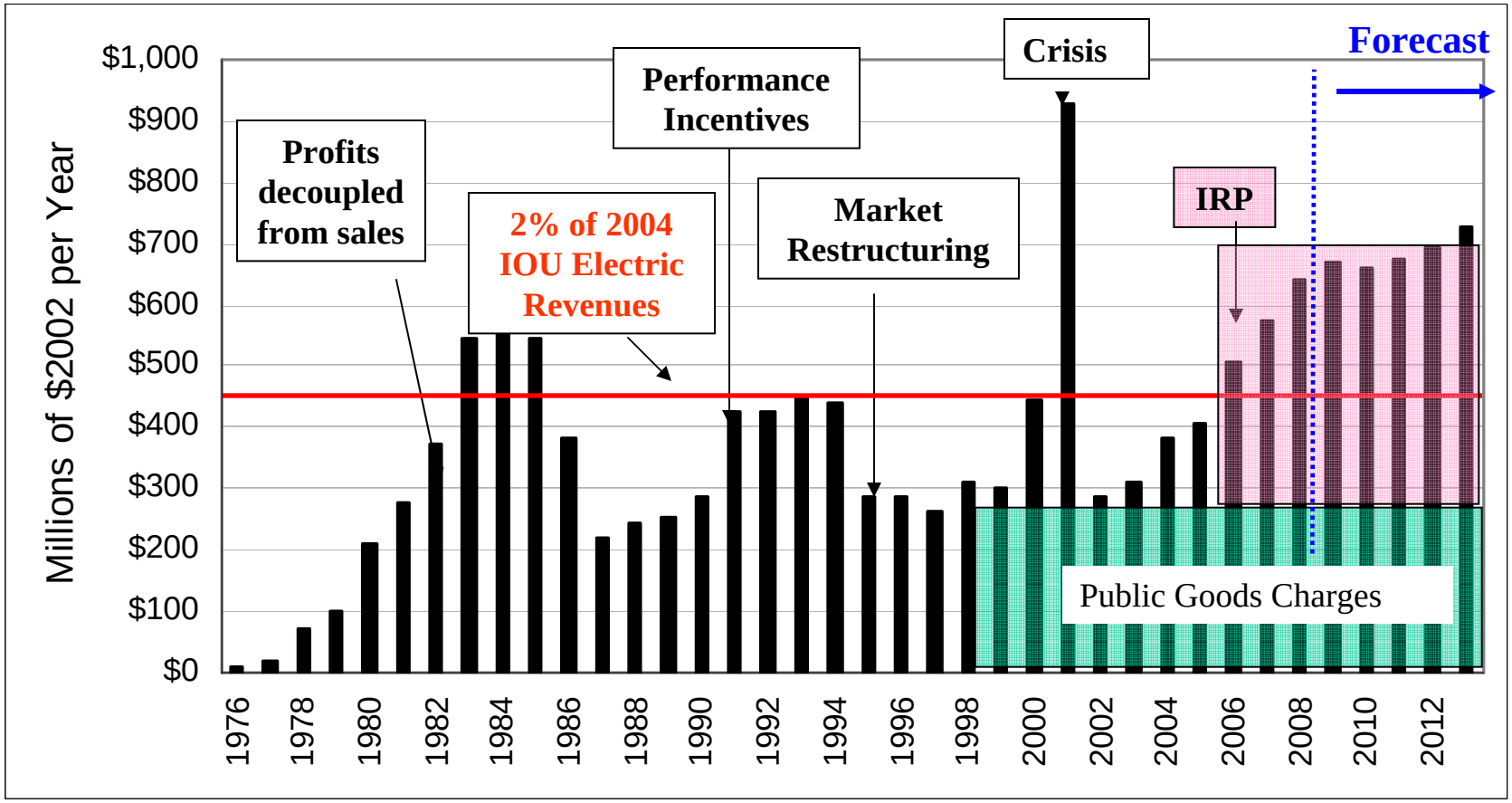
	GWh	% of Total GWh	MW	% of Total MW	Funding ($000)	% of Total Revenue
PG&E	623	0.8%	141	0.6%	$132,752	1.3%
SCE	984	1.2%	185	0.9%	$146,763	1.5%
SDG&E	236	1.4%	51	1.4%	$37,828	1.5%
Total	**1,843**	**1.0%**	**377**	**0.8%**	**$317,343**	**1.4%**

http://www.energy.ca.gov/2005publications/CEC-400-2005-042/CEC-400-2005-042-REV.PDF

Figure 8
Comparison of EE Program Costs to Supply Generation Costs



California IOU's Investment in Energy Efficiency



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EE Procurement by the IOUs

- In September 2004 The CPUC adopted aggressive goals for new energy efficiency savings, covering the next decade of IOU procurement:

1. $6 billion in investment over ten years.
2. 5,000 MW of avoided traditional generation, equivalent to approximately **1% of load per year**.

3. With these goals established, the CPUC is now considering the first **three-year plans, with associated funding levels, to reach the desired targets**:
4. $2.7 billion in investment for 2006-2008, including customer out-of-pocket costs.
5. Investment Increases from $400 million to $800 million annually.
6. IOU efficiency procurement will defer 1500 MW of traditional generation development, with a life cycle effect equivalent to removing **1 Million cars from the road.**

Energy Action Plan

The Energy Action Plan is driven by the Loading Order contained in the multi-agency Energy Action Plan. Since its enactment in 2003, the Loading Order has been integrated into the major CPUC decisions governing energy policy and procurement. Energy resources are prioritized as follows:

- **1. Energy Efficiency/Demand Response**
- **2. Renewable Generation, including renewable DG**
- **3. Increased development of affordable & reliable conventional generation**
- **4. Transmission expansion to support all of California's energy goals.**

Electricity Efficiency and Renewables in California
Goals of California Energy Action Plan 2003

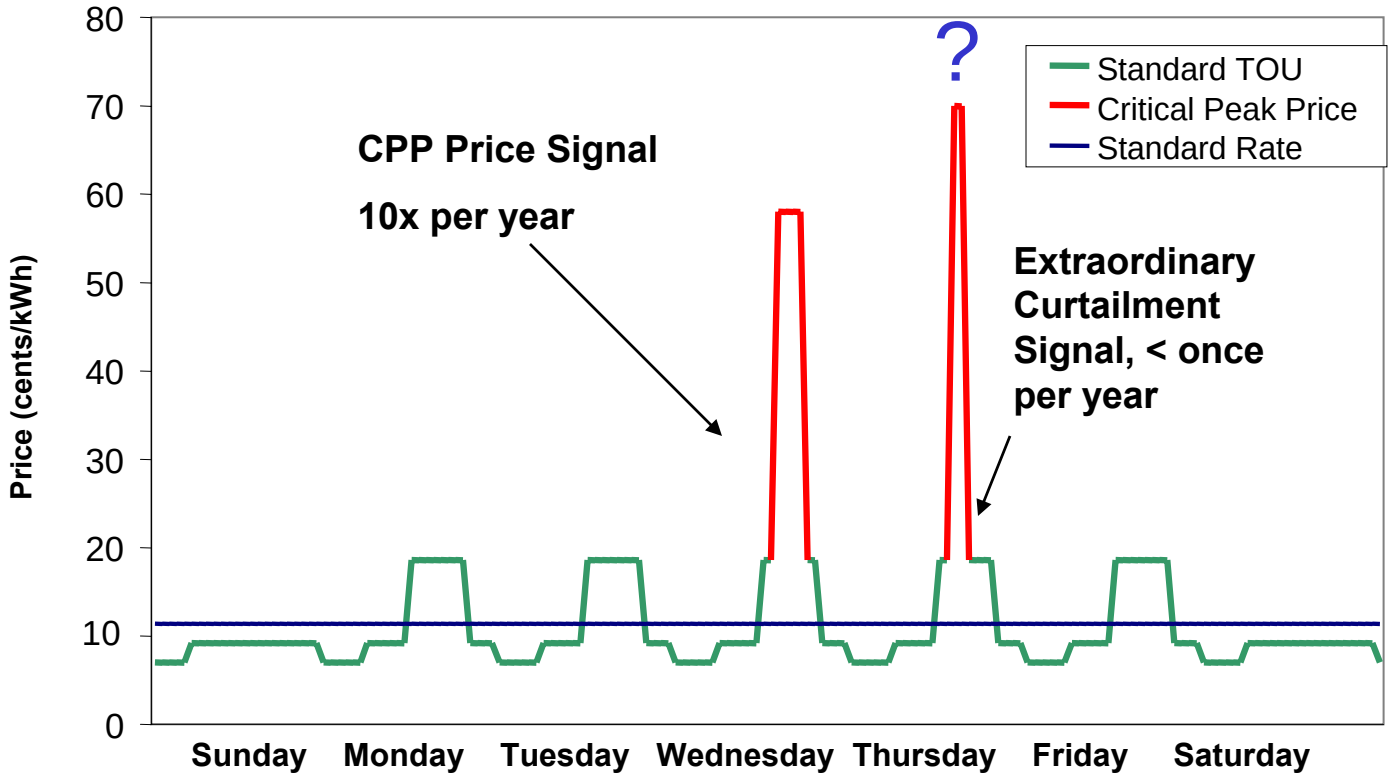
- California kWh per capita is already flat compared to U.S. climbing 2%/yr.
- New California goal is to **reduce** kWh per capita by 1/2% to 1% each year
- Renewable Portfolio Standard: add 1% of renewables per year
- Additional ***peak*** reduction of 1% per year by Demand Response when power is expensive or reliability is a problem
- Some recent initiatives:
  - Green (commercial) Buildings Initiative: to accelerate building efficiency gain by 1% per year
  - Million Solar Homes Initiative (mainly for new homes): to couple super-efficient homes with photovoltaics (PVs)

- **In total, goals aim to reduce electricity growth, increase renewables, and grow demand response**

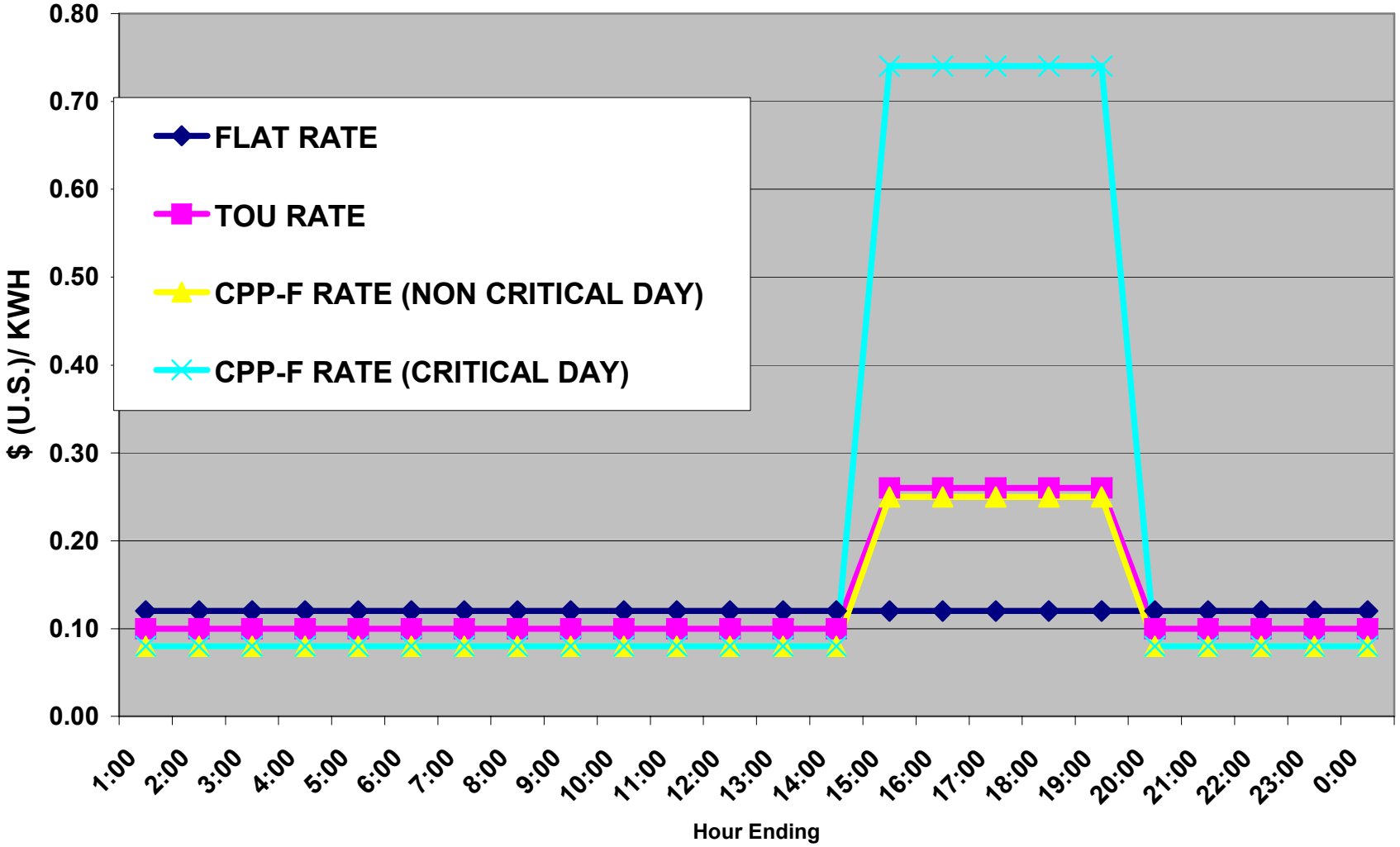
Critical Peak Pricing (CPP)
with additional curtailment option

Potential Annual Customer Savings:

10 afternoons x 4 hours x 1kw = 40 kWh at 70 cents/kWh = ~$30/year



Tariffs being Tested in California Pilot



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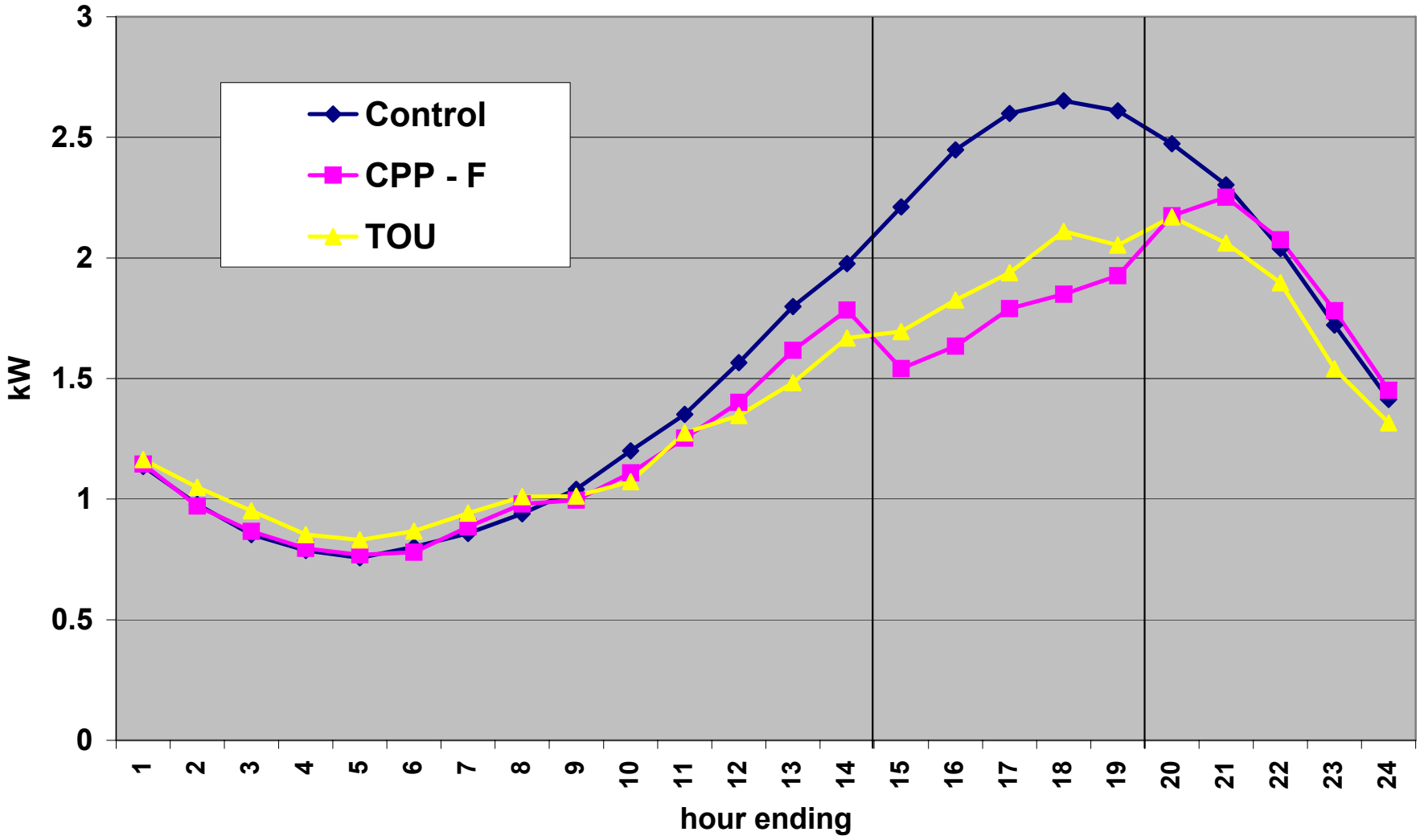
Climate Zone 4 (Very Hot Areas) on CPP Days



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Demand Response and Retail Pricing Pilot

- CPUC and CEC have been testing the impact of CPP on demand
  - Two summers of tests
- Results for residential customers
  - 12% reduction when faced with critical peak prices and no technology
  - 30% to 40% reduction for customers with air conditioning, technology, and a critical peak price.

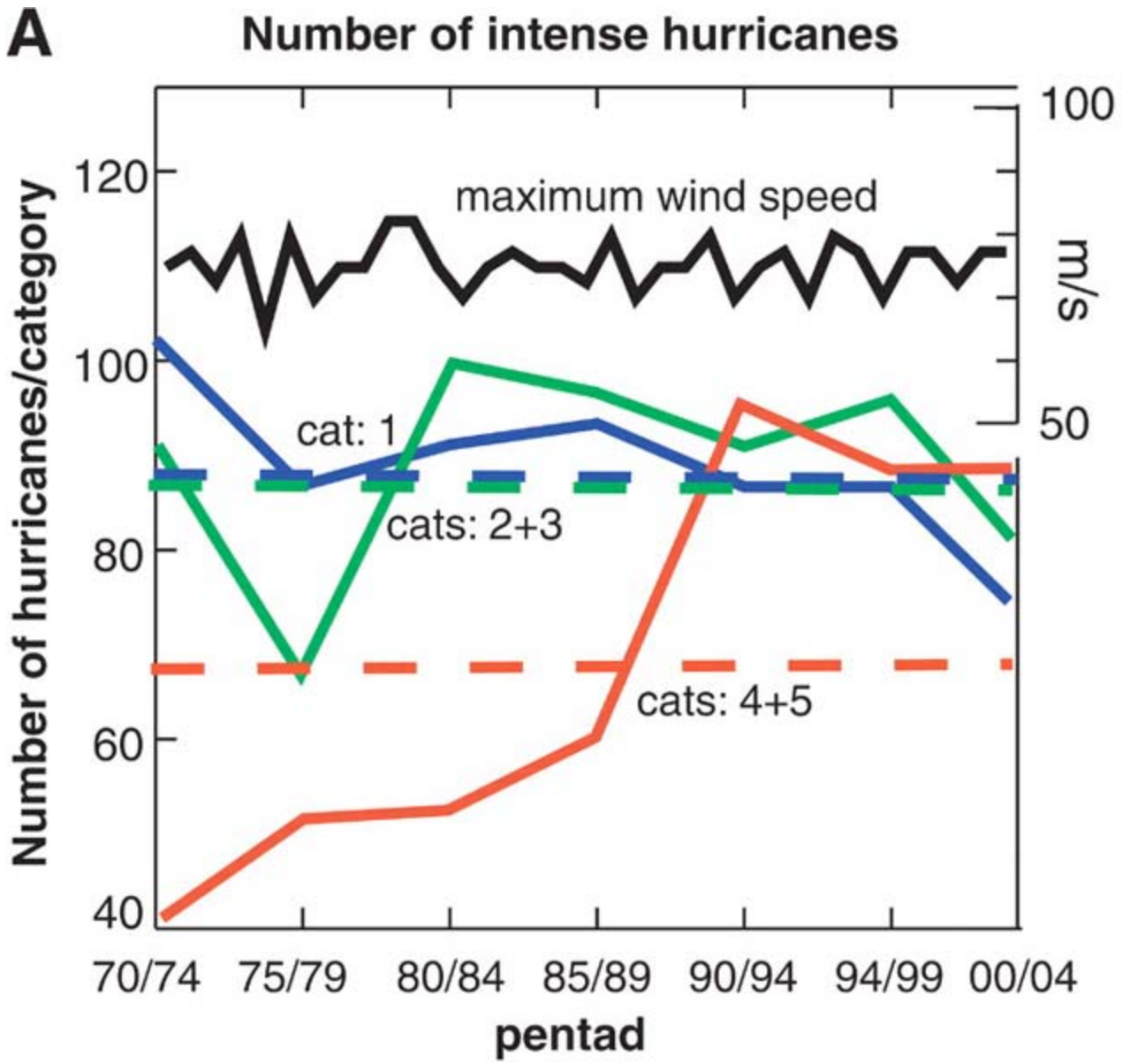
Demand Response and Interval Electricity Meters

Large Commercial Customers

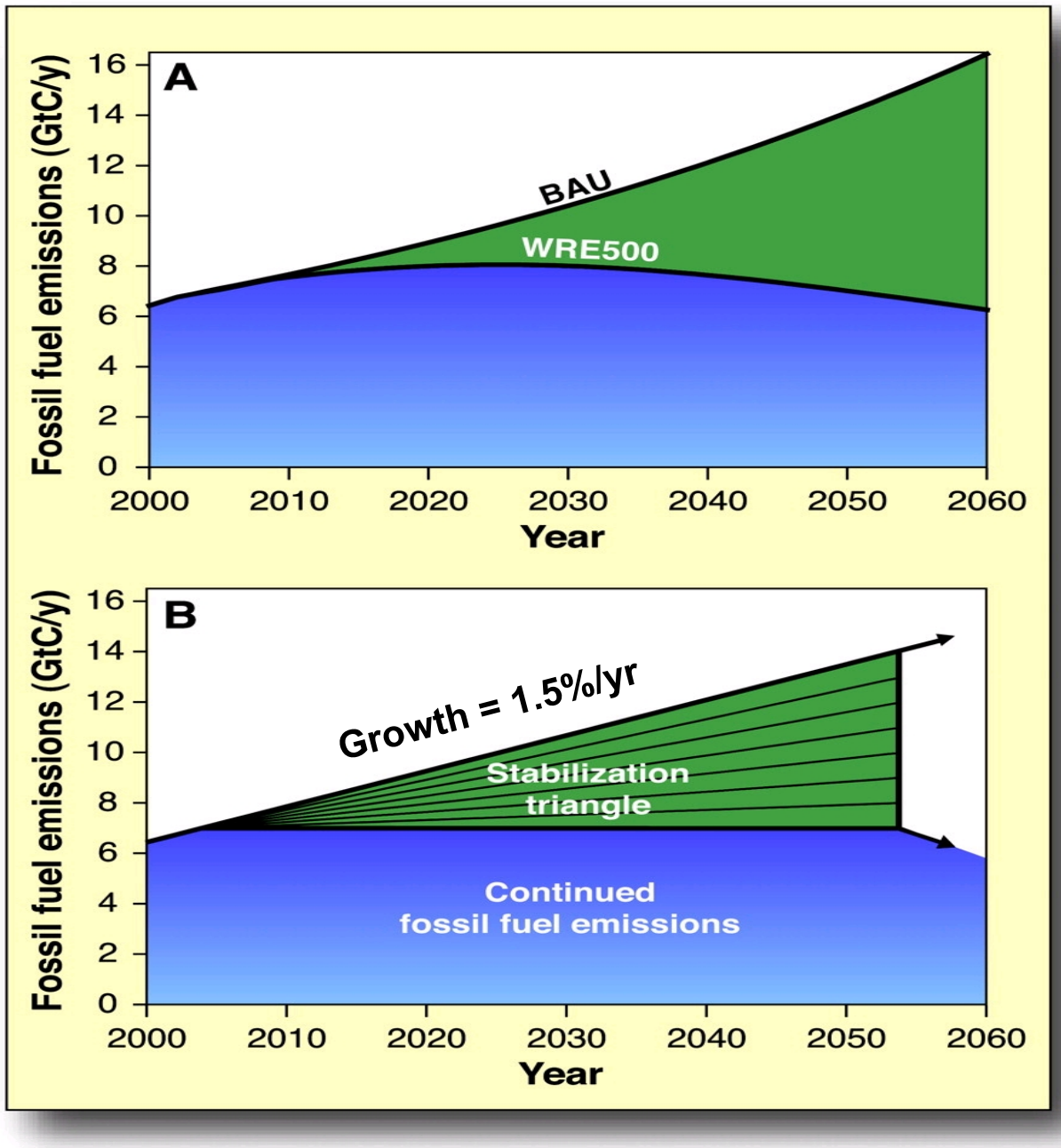
- Currently large customers have interval meters, mandatory time-of-use pricing, and limited voluntary participation in interruptible programs
- Starting Summer 2007, these customers may be put on default Critical Peak Pricing (CPP) tariffs in Investor Owner Utility (IOU) areas

Advanced Metering Infrastructure

- In late 2006, PG&E and SDG&E expect to begin installation of interval meters for ALL electricity customers and will relay gas use and will offer CPP to customers as they get their meters
- Installation to take several years during which time SCE plans to follow suit. By 2011or 2012 all IOU customers will have access to CPP.
- CEC will specify communicating thermostats which can be programmed to response to CPP and for grid protection
  - http://www.title24dr.com/



Source: Webster, et. al, Science Vol. 309



Source: Stabilization Wedges: Pacala and Socolow, Science Vol 305, page 968